SOUTH SASKATCHEWAN RIVER BASIN

WATER ALLOCATION

May 2003 (Revised January 2005)
Regional Services
Southern Region

SOUTH SASKATCHEWAN RIVER BASIN
WATER ALLOCATION

Executive Summary

The *Water Act* governs the allocation of water via licences within the South Saskatchewan River basin. Licencing of 20,000 allocations has occurred since 1894 under a legislated priority system to ensure that a fair distribution of water occurs at all times. The primary water use is for crop irrigation followed by municipal use.

Portions of the basin have been allocated to such an extent that further allocations are restricted. The most recent example is the southern tributaries of the Oldman River where receipt of applications have been suspended until a Water Management Plan is completed. Further allocations in the Bow and Oldman main stems need to be closely evaluated as approximately 70% of the median natural flow is allocated. The use of storage facilities is an important consideration in making allocations. A storage facility has the ability to buffer the effects of one allocation on another depending on the natural flow at the time.

There also is a need to protect the aquatic environment. As a result, recognized in-stream objectives are maintained by placing conditions in new licences as conditions. These conditions will be known as water conservation objectives once they are established in applicable rivers. It is recognized that municipal licences return most of the water taken but in order to satisfy water conservation objectives the return water quality may need to be enhanced.

The 1991 SSRB Water Allocation Regulation identified all potential irrigation projects. This resulted in a limit or cap on the amount of water for each project. A project that has not applied for an allocation has no assurance that it will be issued and if a licence is issued it will be subject to possible restrictions to use during water short years.

Given the potential for the limit of the water resource to be reached, the *Water Act* has provisions for restoring flows to rivers. These provisions are not significant during the short term, however, any increase in river flow to preserve the aquatic environment is beneficial.

Table of Contents

Background 1

Priority of Water Allocations 2

Availability of Water 2

Allocation Purpose 4

Allocation Database 5

Licenced Allocations in Relation to Natural Flow 6

Irrigation Project Limits 8

Restoration of River Flows 11

Conclusions 11

SOUTH SASKATCHEWAN RIVER BASIN
WATER ALLOCATION

LIST OF FIGURES

Figure 1 South Saskatchewan Basin 1

Figure 2 Allocation Volume Bow River Basin 2

Figure 3 SSRB All Water Uses by Purpose 4

Figure 4 SSRB Non-Irrigation Water Use by Purpose 5

LIST OF TABLES

Table 1 Oldman River Basin Licence Allocation 7

Table 2 Bow River Basin Licence Allocation 7

Table 3 Red Deer Basin Licence Allocation 8

Table 4 Oldman River Basin Irrigation Projects 9

Table 5 Bow River Basin Irrigation Projects 10

Table 6 Lower South Saskatchewan River Basin Irrigation Projects 10

Table 7 Red Deer River Irrigation Projects 10

LIST OF APPENDICIES

Appendix I Allocation Tables by Purpose in 2000

Appendix II Allocation Charts – Allocation Volume Versus Natural Flow Volume and Percent of Medium Natural Flow

Appendix III Typical Allocation Priority List

Appendix IV Allocation Charts by Purpose in 2000

Appendix V Historical Allocation Volume and Natural Flow Volume

Background

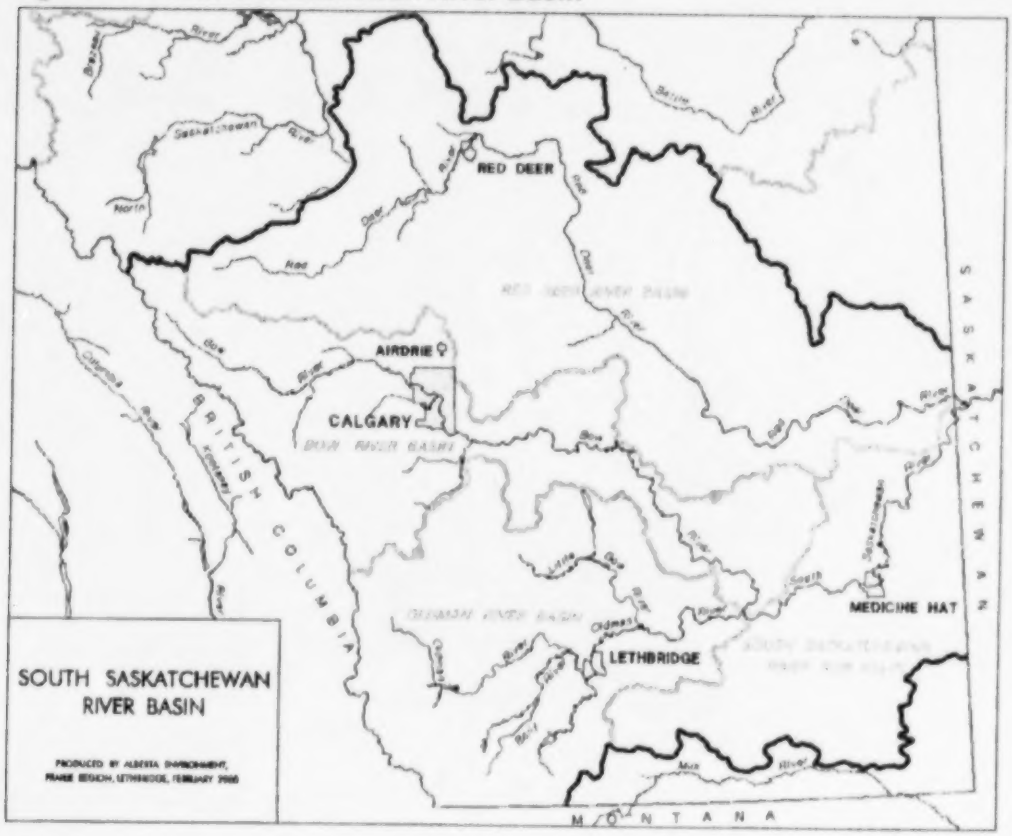
Water allocation licences in the South Saskatchewan River Basin (SSRB) (Fig. 1) have been issued since 1894. Between 1894 and 1931, the Federal Government issued licences under the Northwest Irrigation Act. After 1931, licences were issued by Alberta. The legislation has supported four principles of allocation since 1894. These are:

1. the Crown owns the water,
2. allocations are designed to promote development,
3. licences will be issued for allocations, and
4. there will be a priority system for allocation.

The 1999 *Water Act* confirmed these principles and instituted new approaches based on conservation and water management planning.

This document focuses on the water allocated from surface water supplies only. In Alberta, groundwater that is hydraulically connected to a surface water body is licenced as surface water. No analysis of groundwater licences is included here.

Figure 1. South Saskatchewan River Basin



SOUTH SASKATCHEWAN RIVER BASIN
WATER ALLOCATION

Priority of Water Allocations

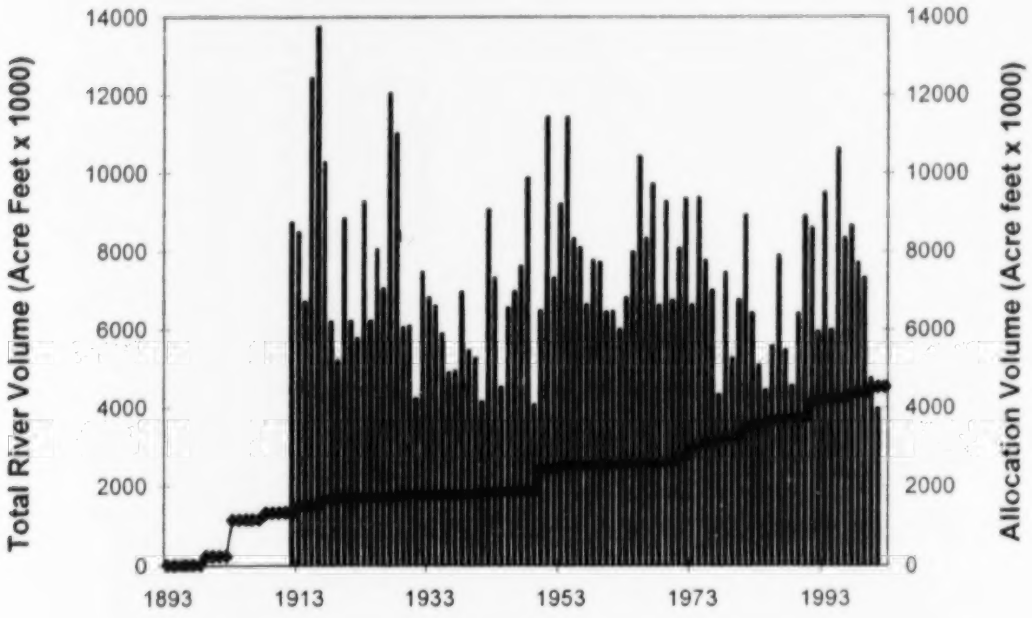
The priority of water use in Alberta is based on a "first in time - first in right" principle. Each allocation is given a priority number that corresponds with the date that a complete application was received. The only exceptions to this are the traditional agriculture allocation of 5 acre-feet (the amount of water covering 5 acres to a depth of one foot) or 6250 cubic meters per year and the household user allocation of 1 acre-foot or 1250 cubic meters per year. A household user is one who owns a dwelling that accesses water on or adjacent to the property.

A household user has a priority over all licenced or registered allocations. A traditional agriculture priority number is based on the first recorded use for animals or pesticide application. However, all applications other than household use are ranked according to priority and not according to use, e.g. municipal use is not ranked ahead of agricultural.

Availability of Water

Allocations of water are often related to the amount of natural flow in streams. Flow and allocations are expressed in cubic meters or acre-feet. Natural flow in the SSRB has been computed for 89 years of record (1912 – 2001).

Figure 2: Allocation Volume - South Saskatchewan Basin



SOUTH SASKATCHEWAN RIVER BASIN
WATER ALLOCATION

Water availability is related directly to the actual flow at any given time. Since river flow can vary, weather can vary and the users requirements can vary, the priority system becomes the only tool that regulates the amount of water licensees can access and the amount of water that remains in the river. In essence, licences can be issued for water use far in excess of low flow water availability because there may be extremely high flow events where more licensees could use water. The issue is that water users normally need a long-term assured supply with predictable availability through the growing season, without storage.

The *Water Act* anticipates that the risk for users could be too great in some situations and permits Alberta Environment to decide to not receive applications *(Section 53)* until the situation can be evaluated to minimize effects (risk) on users and the aquatic environment. This evaluation is now likely to be a Water Management Plan.

In all situations where a water shortage occurs, the *Water Act* has provisions to allow water users to either "call priority" *(Section 30)* to assert their priority to water or "share" water *(Section 33)* via an assignment agreement.

The availability of water is best viewed in model scenarios for the basin on a reach-by-reach basis. This information is available on the SSRB website at http://www3.gov.ab.ca/env/water/regions/ssrb. The results are expressed in deficits based on pre-established criteria of acceptable risk.

SOUTH SASKATCHEWAN RIVER BASIN
WATER ALLOCATION

Allocation Purpose

Much debate occurs when an allocation of water comes under scrutiny for a transfer (purchase), assignment (sharing), change in usage (purpose), cancellation, or is issued for a purpose that another user considers of lesser importance. Charts showing the relative distribution of allocations by purpose are shown in Figure 3 for the entire basin (each sub-basin are in Appendix I). The volumes of allocations are not shown here. Figure 2 gives the relationship between allocation volume and natural flow.

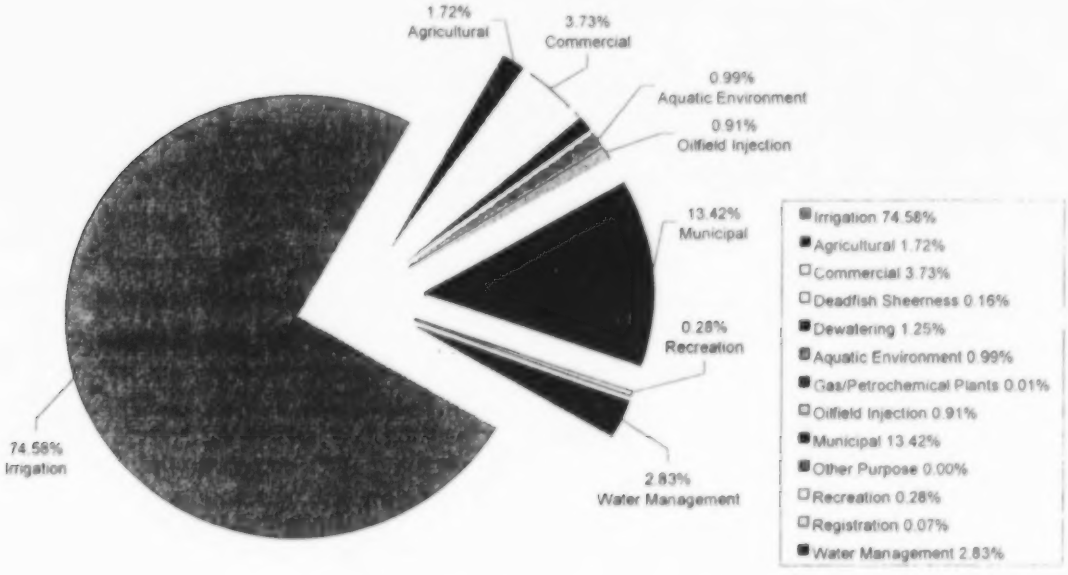


Figure 3: South Saskatchewan River Basin Licenced Water Use by Purpose

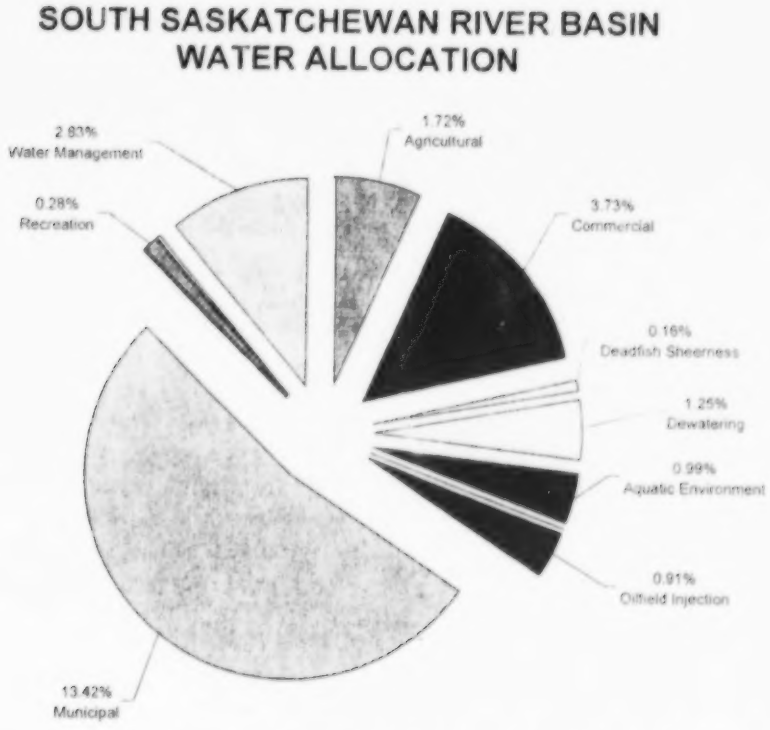


Figure 4: South Saskatchewan River Basin Licenced Water Use* by Purpose

(Irrigation Not Included, Purposes shown represent Approx. 25% of Total))

Allocation Database

Alberta Environment uses the Environmental Management System (EMS) to record all water allocations in Alberta. These publicly available records contain detailed information about the licence that includes the location, source of water, volume allocated, return flow and priority number. The priority number is normally listed as follows, e.g. 20010403002. This is interpreted as year 2001, April 03, second application that day. The priority number is important as it defines the availability of water that the user has in relation to other users. Appendix III contains an example of some of the information.

There are approximately 20,000 licences and registrations in the SSRB. (Any portion of this data can be made available to the public.) Applications for any new allocation licences are no longer being accepted on the Belly, Waterton and St. Mary Rivers. Applications for only municipal use and small stockwatering are accepted in the basins of Ross Creek, Willow Creek, and the Highwood River.

Consumption and return flow data are to be recorded by licence holders and be made available or submitted annually to Alberta Environment. The allocation database is in hard copy format and is difficult to access. Electronic submission

of data from water users is likely to be implemented in the near future so the data will be more readily available.

Licenced Allocations in Relation to Natural Flow

A commonly used expression of water allocations in relation to natural flow is % of median flow. Median flow is comparable to an arithmetic average but differs in that the median has an equal number of values higher and lower than it. This has been computed over an 89 - year period (1912 – 2001) for the South Saskatchewan Basin.

When allocations reach 50% of median natural flow it is an indication that limits to allocations should be evaluated. Additional factors include the flow patterns, storage, apportionment and the frequency that water shortages occur. This is related to the apportionment criteria of 50% of total (not median) natural flow in any year that must be passed to Saskatchewan.

In a high flow year, 50% of median natural flow could be a small portion of the natural flow for that year (e.g. 25% of natural flow). Conversely, in a water-short year, 50% of median natural flow could be a much higher proportion of the flow for that year (e.g. 80% of natural flow at the time). The governing factor for assessing when allocations are stressing a river system, at present, is the in-stream objective that controls the amount of water for aquatic protection and apportionment. When these flows are approached, Alberta Environment curtails withdrawals in accordance with licence conditions and priority.

In the Oldman and Bow basins, the allocation volume exceeds natural flow at times; however, storage, patterns of use, return flow and weather conditions (wet seasons) frequently mitigate the situation. The graphs in Appendix 5 illustrate this situation. In the case of the Oldman River, the Oldman dam as well as other structures in the southern tributaries; buffer the demand, allow in-stream objectives to be achieved and supplement apportionment.

Some allocations have return flows that allow water to be reused by other licences. Returned water is not accounted for in the licencing process, however, modeling of water use does account for this. A prime example of significant water return takes place in many municipalities. A common estimate is that 80% of municipal water use returns to a surface water via a wastewater treatment plant release. At least one municipality in the basin has questioned the application of the priority system against them when they return the water and has asked for a credit or exemption from the in-stream objectives being applied if they can meet quality requirements. Other jurisdictions have considered this and created systems for evaluating "conserved" or "recycled" water.

SOUTH SASKATCHEWAN RIVER BASIN
WATER ALLOCATION

Table 1. Oldman River Basin Licence Allocation

Locations	Median (1912-1995) Natural Flows Acre-feet	Total Allocation	
		Acre-feet	%Median
Oldman near Brocket	980,788	33,276	3.4%
Pincher Creek	23,440	2,523	10.8%
Oldman near Ft. Macleod	1,010,875	430,334	42.6%
Willow Creek near Nolan	82,545	16,221	19.7%
Oldman Lethbridge (CDN share)	2,393,374	1,666,006	69.6%
Oldman River mouth	2,399,082	1,689,608	70.4%

Table 2. Bow River Basin Licence Allocation

Locations	Median Natural Flows Acre-feet	Total Allocation	
		Acre-feet	%Median
Bow at Calgary	2,318,258	317,996	13.7%
Elbow River	222,068	105,459	47.5%
Bow below WID	2,549,843	709,726	27.8%
Highwood River	538,030	138,558	25.8%
Bow below Carseland	3,096,099	1,323,485	42.7%
Bow below Bassano	3,107,226	2,107,699	67.8%
Bow River at mouth	3,106,440	2,116,546	68.1%

In the case of the Red Deer River, allocations are substantially lower than the other two rivers and relatively low in comparison to the natural flow.

Table 3. Red Deer Basin Licence Allocation

Locations	Median Natural Flows Acre-feet	Total Allocation	
		Acre-feet	%Median
At Dickson Dam	828,138	41,800	5.0%
Near Red Deer	1,099,969	76,014	6.9%
Near Nevis	1,179,441	85,830	7.3%
Near Drumheller	1,246,325	140,668	11.3%
Near Bindloss	1,285,784	236,793	18.4%

Irrigation Project Limits

Following a review of SSRB water management in the 1980s, the 1991 South Saskatchewan Basin Water Allocation Regulation (AR307/91) was created to identify all present and future irrigation projects. The acreage for each project was determined and Alberta Environment assessed a volume to correspond with the acreage based on characteristics of the project such as evaporation and seepage. This capped any further allocations for irrigation, but did not give the projects any assurance of availability of water.

The Regulation does not provide any guarantee that there will be an allocation. It is possible for an allocation to be made, but projects applying for an allocation now would be subject to any proposed water conservation objectives, and those from the Oldman and Bow basins would have a "junior" priority so their exposure to risk of not having water during periods of water shortage would be significant.

The following tables describe the regulation acreage limits with a corresponding volume as assigned by Alberta Environment (for the irrigation districts) based on an estimate of 1.5 feet per acre for most other projects. The actual or applied for acres (depending on the project) are shown to give a picture of the relative development to the year 2000. "Applied for" acreage is listed as it is an indication of the project or area's situation in regard to ongoing licencing. The irrigation District acreage is described as "actual" (or estimates) because most Districts have been licenced for an amount equivalent to the corresponding acreage.

Table 4. Oldman River Basin Irrigation Projects

Project	AR307/91 Limit (acres)	Applications or Actual (acres)	AR307/91 Reg. Limit (acre-ft)	Year 2000 Diversion (acre-ft)
Aetna ID	3,530	2361	9,000	7,000[1]
Leavitt ID	4,770	4763	12,000	11,000[1]
Lethbridge Northern ID	167,000	152,000	317,000	246,000
Magrath ID	18,300	15,500	34,000	30,000
Mountain View ID	3,700	3510	8,000	7,000[1]
Raymond ID	46,500	39,000	81,000	43,000
St. Mary ID	372,000	352,000	722,000	540,000
Taber ID	82,200	79,000	158,000	140,000
United ID	34,000	19,750	68,000	37,500[1]
Blood	25,000	25,000	40,270	Not Available
Piikani	15,000	0	35,000	0
Keho Barons S	10,000	10,000	15,000	0
Western Oldman	6,000	6,031	9,000	Not Available
Oldman Reservoir	15,000	3,741	22,500	Not Available
Willow Creek	13,000	9,733	19,500	Not Available
Other Oldman Basin	68,000	68,483	102,000	Not Available

1. Estimated

Table 5. Bow River Irrigation Projects

Project	AR307/91 Limit (acres)	Applications or Actual (acres)	AR307/91 Reg. Limit (acre-ft)	Year 2000 Diversion (acre-ft)
Bow River ID	210,000	200,000	502,000	418,000
Western ID	95,000	64,400	278,000	156,500
Eastern ID	286,000[1]	279,000	762,000	716,000
Siksika	20,000[2]	5,000	35,000[3]	7,500
Keho Barons N	10,000	0	15,000	0
Little Bow	20,000	28,019	30,000	0
Other	45,000	40,530	67,500	60,000

1. 276,000 acres increased to 286,000 by Irrigation Council.
2. Siksika had 5000 acres prior to 1991 Regulation.
3. Estimated.

Table 6. Lower South Saskatchewan River Basin Irrigation Projects

Project	AR307/91 Limit (acres)	Applications or Actual (acres)	AR307/91 Reg. Limit (acre-ft)	Year 2000 Diversion (acre-ft)
Ross Creek ID	1,200	1,200	3,000	0
Other Contributing	28,000	28,133	42,200	42,200
Non-Contributing (Pakowki Basin)	24,000	21,092	31,638	31,638

Table 7. Red Deer Basin Irrigation Projects

Project	AR307/91 Limit (acres)	Applications or Actual (acres)	AR307/91 Reg. Limit (acre-ft)	Year 2000 Diversion (acre-ft)
SAWSP	25,000	0	37,500	0
Other	72,000	36,000	108,000	56,000

Restoration of River Flows

There is an ability to use transfer holdbacks or cancellations under the Water Act to restore water to streams provided there are restrictions to prevent reallocating a cancellation or holdback.

This is a long-term endeavour that should not be discouraged but the practicality of expecting significant benefits are limited. The following example explains limitations;

- It requires about 0.0143 cubic meters per second (cms) flowing in a stream for a day to produce 1 acre-foot of water.
- 365 acre-feet would provide about 0.01428 cms of flow for a year and 25560 acre-feet would provide about 1 cms for a year
- If a holdback is 10% of the amount to be transferred, about 255,600 acre feet would need to change hands to allow the Crown to increase the flow in one stream by 1 cms for the full year.

To put this in perspective; to gain 1 cms for a stream for the full year:

- About 80% of the water used in the Lethbridge Northern Irrigation District would need to change hands;
- About 35% of the water used in the St. Mary River Irrigation District would need to change hands;

An irrigation district is unlikely to transfer a portion of a licence and since three quarters of the allocation volume is held by irrigation, this further reduces the likelihood of restoring much flow to rivers in the SSRB.

Restoration of flows to rivers is possible but is not significant during the short term. However, any increase in river flow to preserve the aquatic environment is beneficial.

Conclusions

- Irrigation licences in the SSRB account for 75% of the total volume of SSRB allocations. Specific irrigation usage is as follows:
  - 20% of the allocations from the Red Deer,
  - 76% of the allocations from the Bow River,
  - 87% of the allocations from the Oldman River, and

- 18% of the allocations from the Medicine Hat portion of the South Saskatchewan River.

- Municipal licences in the SSRB account for 13% of the total volume of allocations. Specific municipal use in each sub basin is as follows:
  - 12% of the allocations from the Red Deer River,
  - 18% of the allocations from the Bow River,
  - 2.7% of the allocations from the Oldman River, and
  - 66% of the allocations from the Medicine Hat portion of the South Saskatchewan River.

- Most irrigation projects identified in the 1991South Saskatchewan Basin Water Allocation Regulation are nearing limits

- The Southern Tributaries of the Oldman River have a high degree of allocation:

St. Mary	118% of median	510,000 ac-ft
Belly	80% of median	686,000 ac-ft
Waterton	75% of median	417,000 ac-ft

- The Bow and Oldman Rivers have a significant degree of allocation:

Oldman	70% of median	1,689,608 ac-ft
Bow River	68% of median	2,116,546 ac-ft

- The Red Deer River has a low degree of allocation:

Red Deer	18.4% of median	236,793 ac-ft

- Some irrigation projects in the SSRB regulation have not made application for significant amounts of their limits. The projects are:
  - Keho-Barons North
  - Siksika
  - Special Areas
  - Red Deer Basin
  - Oldman Reservoir

- The Keho-Barons North, Siksika and Oldman Reservoir projects will be exposed to significant risk of water not being available in water short years.

- Cancellation of water allocations for non-use for any users other than irrigation will have minimal effect on replenishing significant flows.

- There will be insufficient transfers with associated WCO holdbacks to replenish significant flows.

APPENDICES

(In some of these appendices the term dam^3 (cubic decametres) is used to express volume. A dam^3 is 1,000 m^3, or 0.81 acre-foot.)

APPENDIX I

Allocation Tables by Purpose in 2000

SOUTH SASKATCHEWAN RIVER BASIN
WATER ALLOCATION

South Saskatchewan River Basin		Maximum Diversion (m^3)
Total		5,623,914,270.83
Irrigation	74.58%	4,194,409,635.73
Agricultural	1.72%	96,735,655.34
Commercial	3.73%	209,588,974.54
Deadfish Sheerness	0.16%	8,944,234.00
Dewatering	1.25%	70,288,810.00
Habitat Enhancement	0.68%	38,006,753.54
Gas/Petrochemical Plants	0.01%	405,801.54
Oilfield Injection	0.91%	51,221,572.76
Management of Fish	0.31%	17,425,393.33
Management of Wildlife	0.00%	88,680.00
Municipal	13.42%	754,665,962.60
Other Purpose	0.00%	43,026.97
Recreation	0.28%	15,676,529.43
Registration	0.07%	4,012,799.59
Water Management	2.83%	158,942,494.00

SOUTH SASKATCHEWAN RIVER BASIN
WATER ALLOCATION

Bow River Basin		M^3
Total		2,770,073,049.21
Irrigation	76.35%	2,114,963,934.50
Agricultural	0.37%	10,243,381.67
Commercial	1.88%	51,944,189.76
Deadfish Sheerness	0.00%	0.00
Dewatering	1.56%	43,181,760.00
Habitat Enhancement	0.05%	1,418,425.49
Gas/Petrochemical Plants	0.03%	946,520.00
Oilfield Injection	0.30%	8,328,452.76
Management of Fish	0.51%	14,124,853.33
Management of Wildlife	0.00%	0.00
Municipal	17.57%	486,694,923.17
Other Purpose	0.00%	932.50
Recreation	0.30%	8,260,104.43
Registration	0.02%	518,578.60
Water Management	1.06%	29,385,324.00

SOUTH SASKATCHEWAN RIVER BASIN
WATER ALLOCATION

Oldman River Basin		M^3
Total		2,218,900,923.01
Irrigation	87.42%	1,939,669,961.41
Agricultural	0.85%	18,913,489.00
Commercial	3.73%	82,828,180.00
Deadfish Sheerness	0.00%	0.00
Dewatering	0.51%	11,255,550.00
Habitat Enhancement	0.41%	9,052,830.00
Gas/Petrochemical Plants	0.00%	0.00
Oilfield Injection	0.10%	2,135,120.00
Management of Fish	0.01%	126,980.00
Management of Wildlife	0.00%	24,680.00
Municipal	2.70%	59,817,885.53
Other Purpose	0.00%	36,650.47
Recreation	0.08%	1,876,120.00
Registration	0.04%	912,576.60
Water Management	4.16%	92,250,900.00

SOUTH SASKATCHEWAN RIVER BASIN
WATER ALLOCATION

South Saskatchewan River Basin (Oldman/Bow confluence to border)

		M^3
Total		252,631,487.28
Irrigation	17.98%	45,420,268.34
Agricultural	3.44%	8,701,765.75
Commercial	10.70%	27,036,974.00
Deadfish Sheerness	0.00%	0.00
Dewatering	1.23%	3,113,280.00
Habitat Enhancement	0.02%	62,900.00
Gas/Petrochemical Plants	0.00%	0.00
Oilfield Injection	0.00%	0.00
Management of Fish	0.00%	0.00
Management of Wildlife	0.00%	0.00
Municipal	66.26%	167,392,100.00
Other Purpose	0.00%	444.00
Recreation	0.25%	641,420.00
Registration	0.10%	262,335.19
Water Management	0.00%	0.00

SOUTH SASKATCHEWAN RIVER BASIN
WATER ALLOCATION

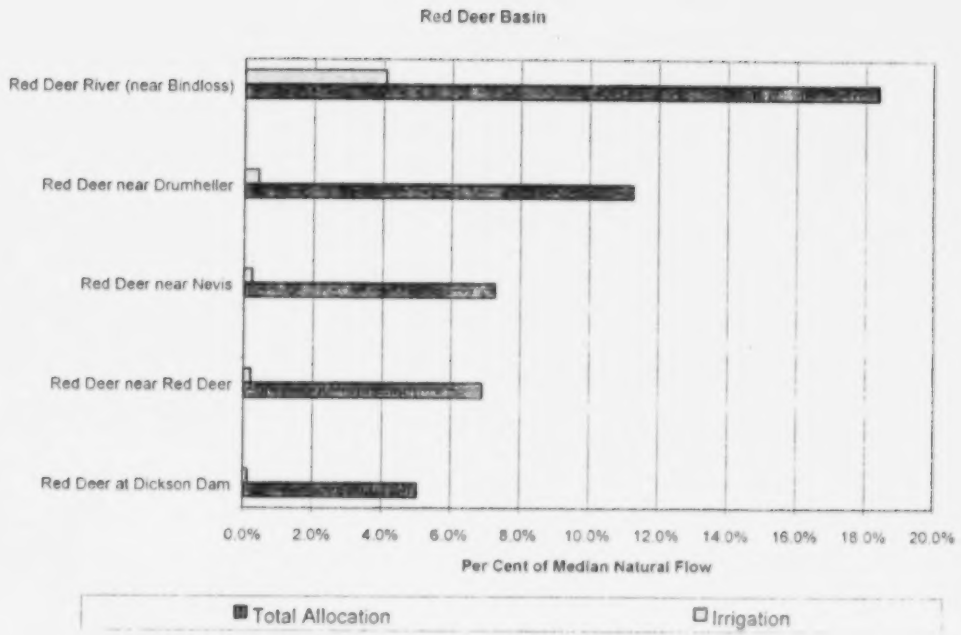
Red Deer River Basin		M^3
Total		341,518,101.33
Irrigation	20.33%	69,422,841.48
Agricultural	15.35%	52,417,245.92
Commercial	13.98%	47,732,770.78
Deadfish Sheerness	2.62%	8,944,234.00
Dewatering	3.33%	11,356,730.00
Habitat Enhancement	5.88%	20,077,968.05
Gas/Petrochemical Plants	9.31%	31,781,890.00
Oilfield Injection	3.46%	11,831,670.00
Management of Fish	0.91%	3,097,080.00
Management of Wildlife	0.02%	64,000.00
Municipal	11.82%	40,373,729.90
Other Purpose	0.00%	5,000.00
Recreation	1.43%	4,898,885.00
Registration	0.65%	2,207,786.20
Water Management	10.92%	37,306,270.00

Appendix II

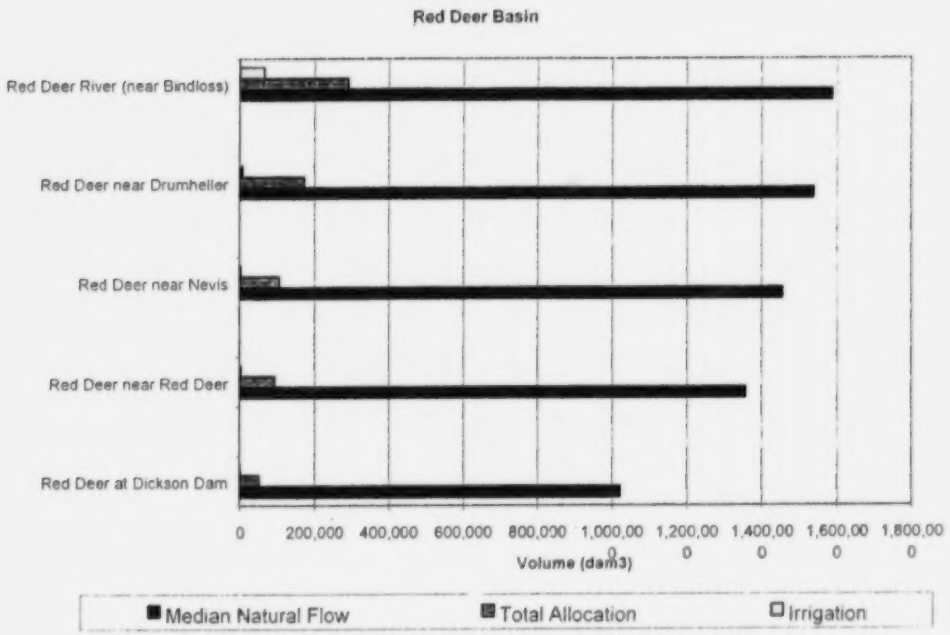
Allocation Charts

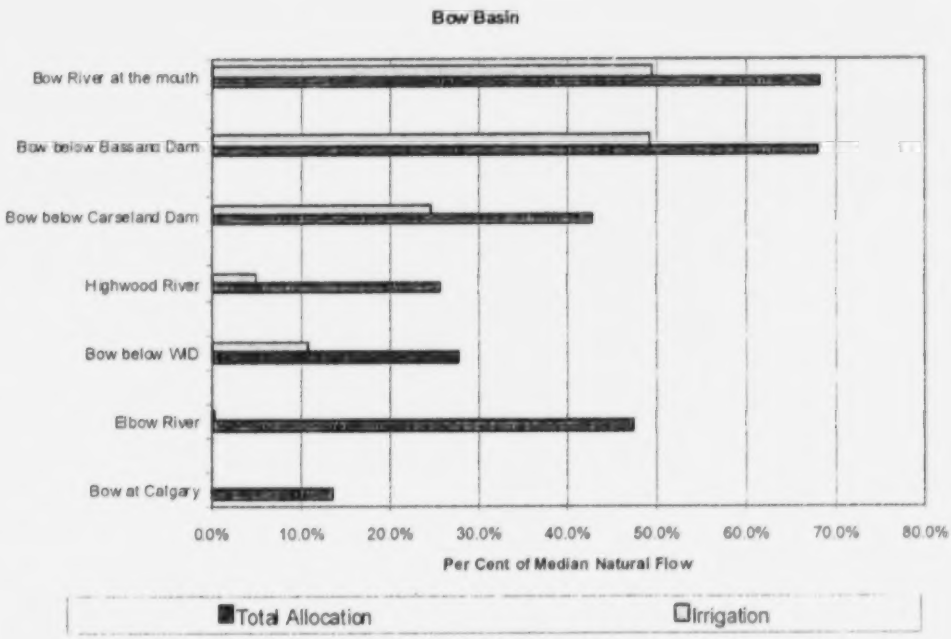
Allocation Volume
Versus
Natural Flow Volume and Percent of Medium Natural Flow

SOUTH SASKATCHEWAN RIVER BASIN
WATER ALLOCATION

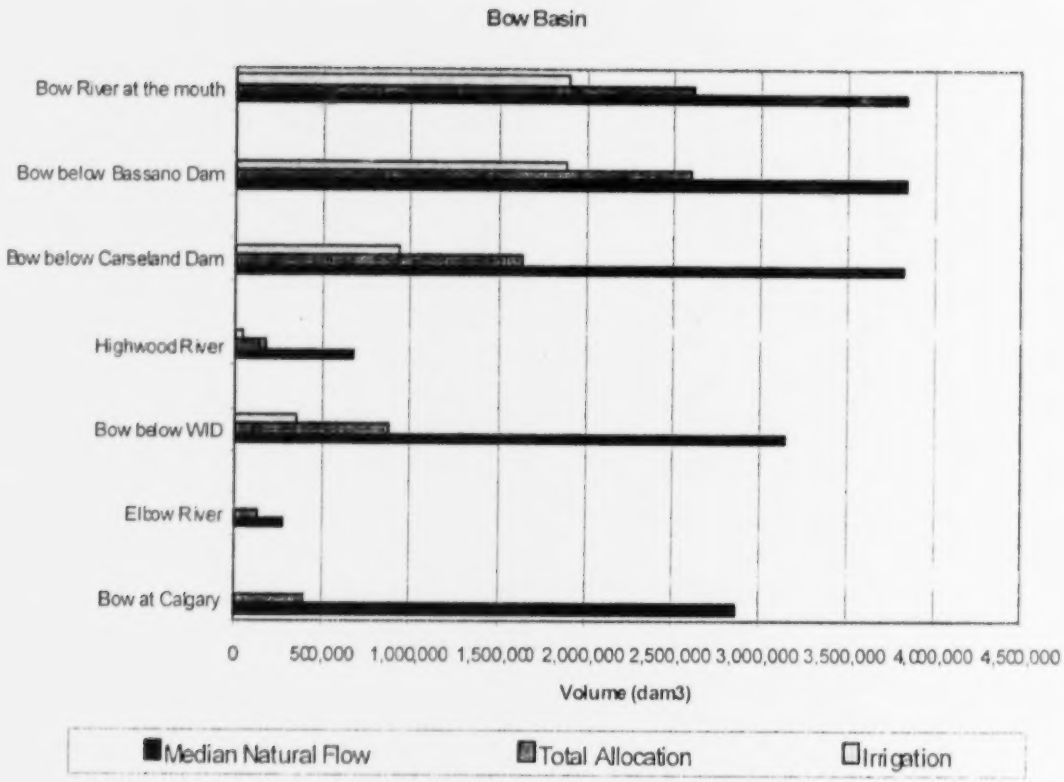


SOUTH SASKATCHEWAN RIVER BASIN
WATER ALLOCATION

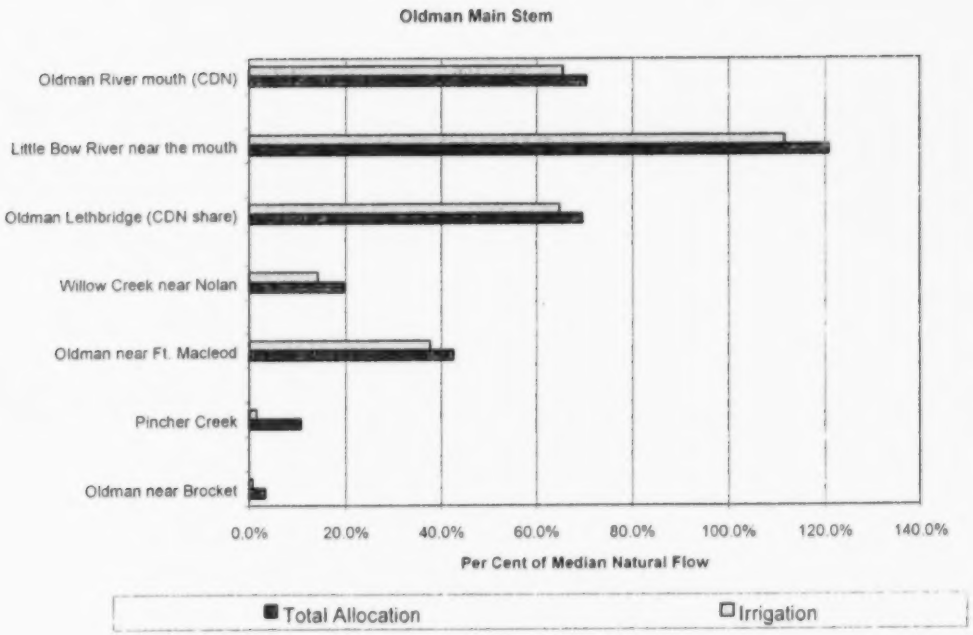




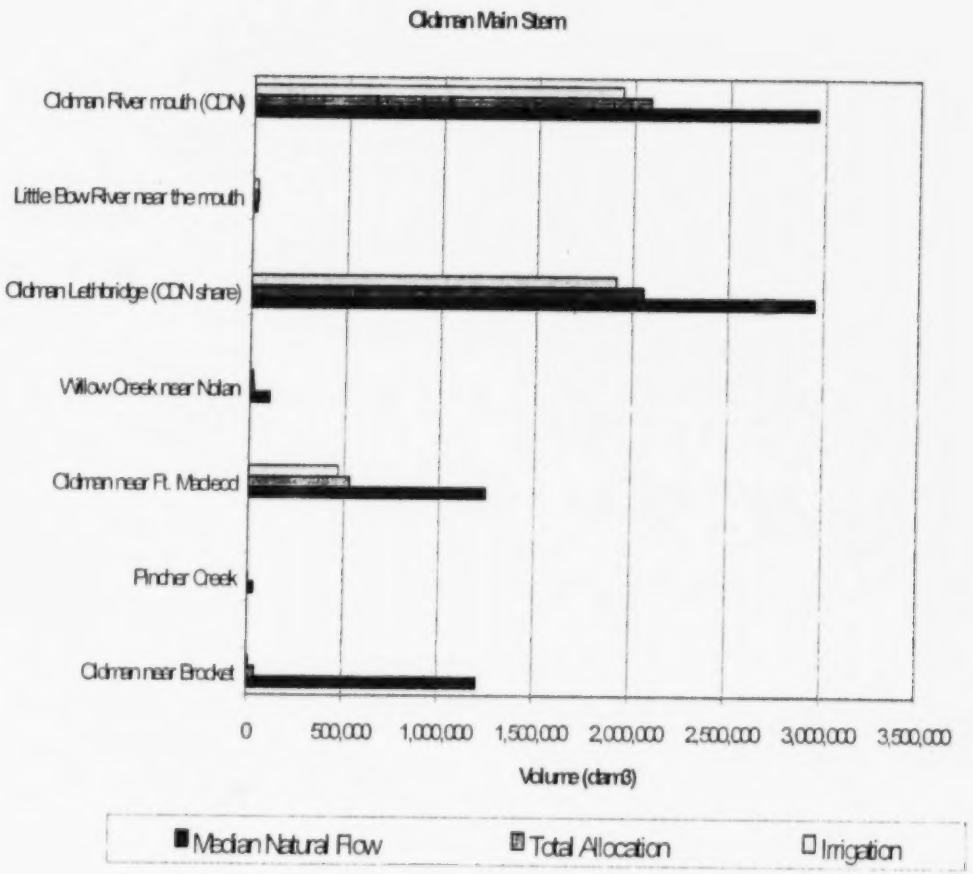
SOUTH SASKATCHEWAN RIVER BASIN
WATER ALLOCATION



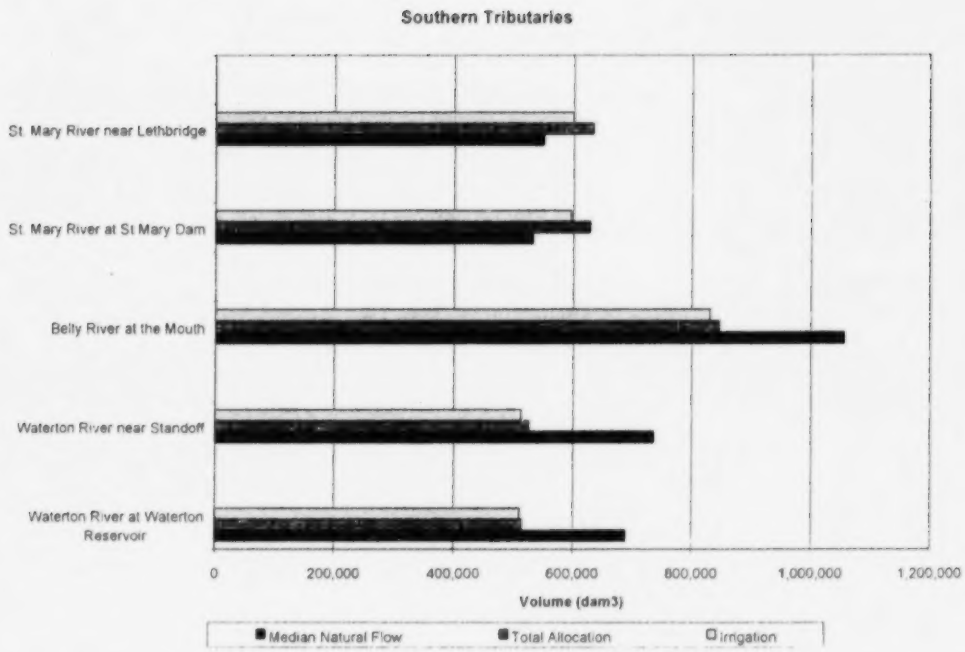
SOUTH SASKATCHEWAN RIVER BASIN
WATER ALLOCATION



SOUTH SASKATCHEWAN RIVER BASIN
WATER ALLOCATION



SOUTH SASKATCHEWAN RIVER BASIN
WATER ALLOCATION



Appendix III

Typical Allocation Priority List

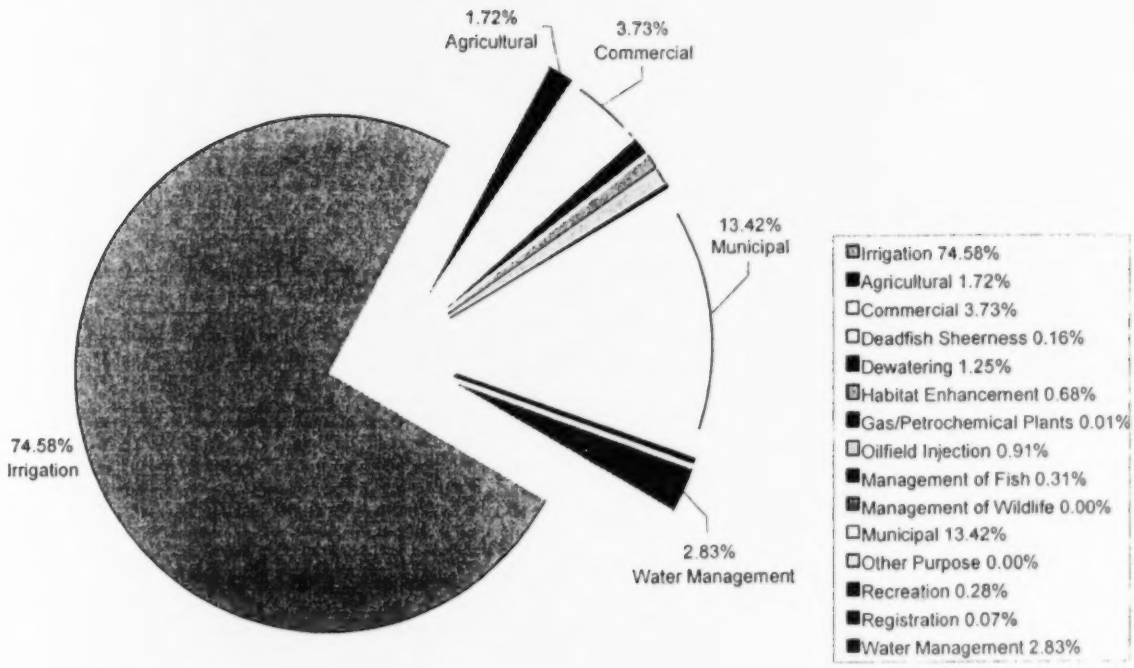
SOUTH SASKATCHEWAN RIVER BASIN
WATER ALLOCATION

Selected Allocation List			
AFFECTED (SOURCE)	PRIORITY	MAX. ANNUAL USE (cubic meters)	APPROVAL HOLDER
Oldman River	19890726008	8630	KLOK, MARIANNE
Etzikom Coulee	19910219002	45658	HUTTERIAN BRETHREN OF MILTOW
Waterton River	19910422009	77742	HUTTERIAN BRETHREN CHURCH OF EWELME
Bow River	19930607005	24640	SUNTERRA FARMS LTD.
Crowfoot Creek	19980406002	37020	PINNACLE SWINE INC.
Oldman River	19990316004	51000	SCHWARTSKOPF FARMS LTD.
Beaver Creek	20000308004	1851	HAMMOND, SCOTT
Bow River	20000310002	61500	HUTTERIAN BRETHERN OF TWIN CREEK
Bow River	20000414004	33304	PINNACLE SWINE INC.
Oldman River	20000516001	381306	G.THOMPSON LIVESTOCK COMPANY INC.
Bow River	20000615002	43000	HUTTERIAN BRETHREN OF GREEN ACRES
Red Deer River	20000926010	5900	EVERT & JANNETTE VAN BENTHEM
Oldman River	20001127001	25914	KONYNENBELT, WESLEY
Oldman River	20001127002	43190	HANEY FARMS (1985) LTD.
Bow River	20010528001	50573	VAN NISTELROOY, ALBERT
Bow River	20010528002	214626	VAN NISTELROOY, ALBERT
Gough Lake	20010917002	2580	RALPH & KAREN KLASSEN
Little Red Deer River	20020204001	22000	GRACE FEEDYARDS LTD.

Appendix IV

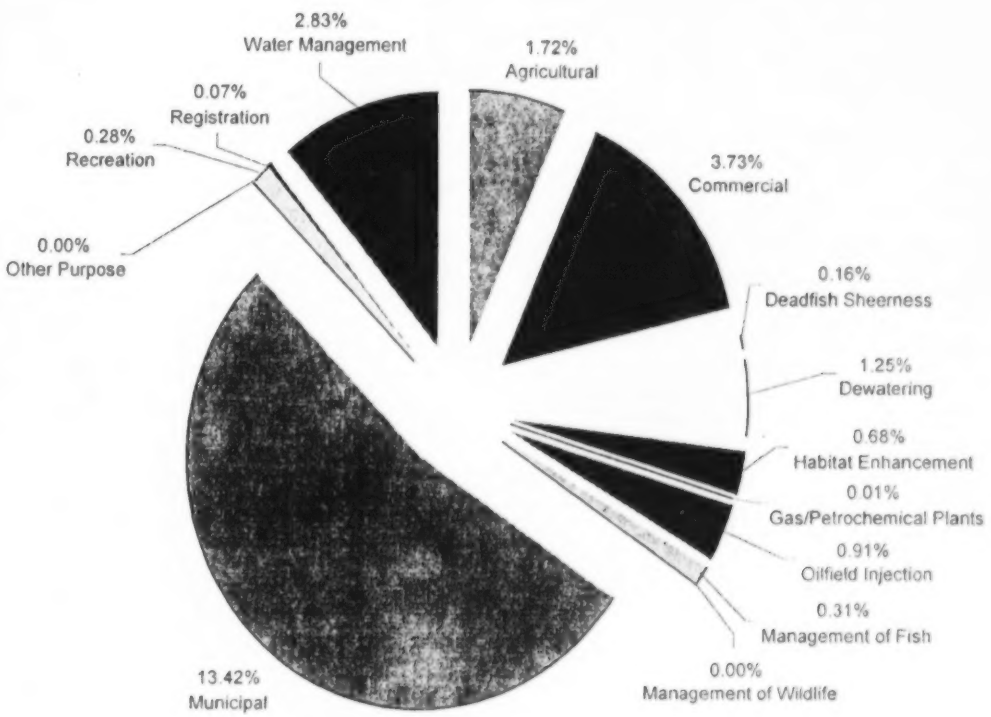
Allocation Charts by Purpose in 2000

SOUTH SASKATCHEWAN RIVER BASIN
WATER ALLOCATION



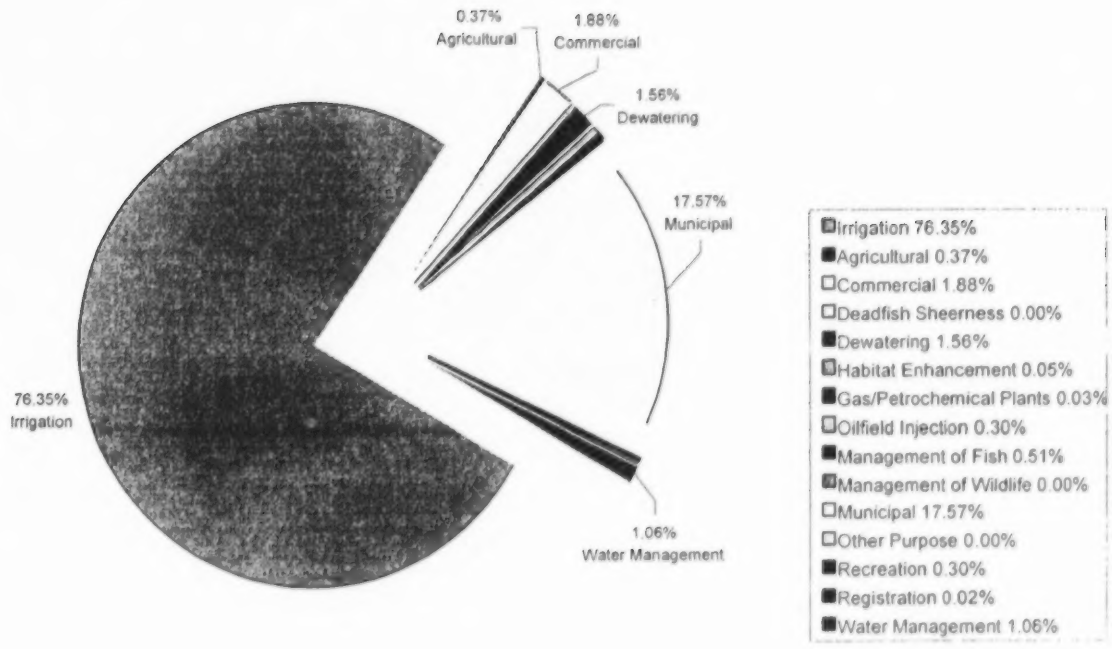
South Saskatchewan River Basin
Licenced Water Use by Purpose

SOUTH SASKATCHEWAN RIVER BASIN
WATER ALLOCATION



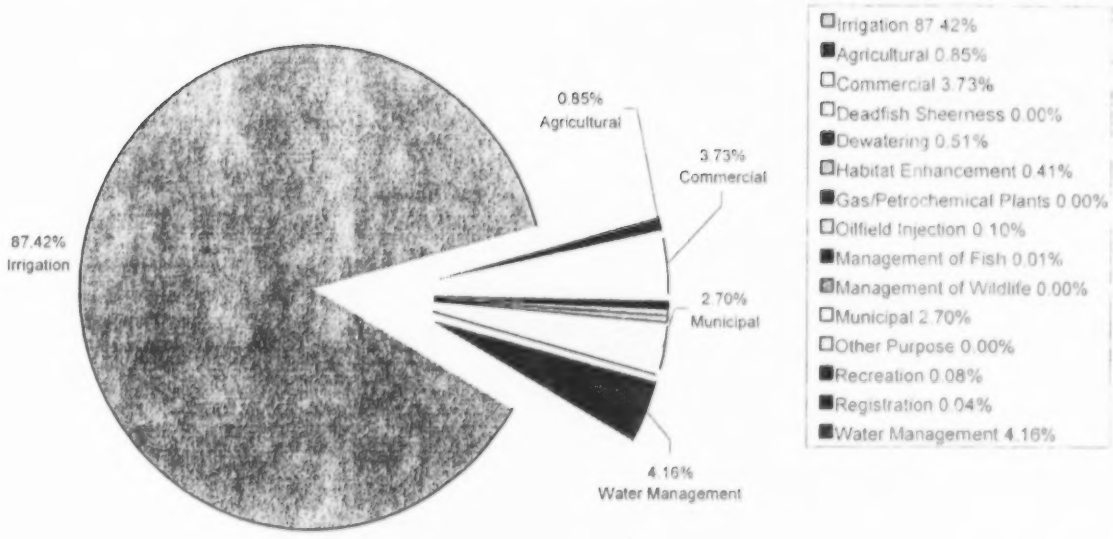
South Saskatchewan River Basin
Licenced Water Use by Purpose (other than irrigation)

SOUTH SASKATCHEWAN RIVER BASIN
WATER ALLOCATION



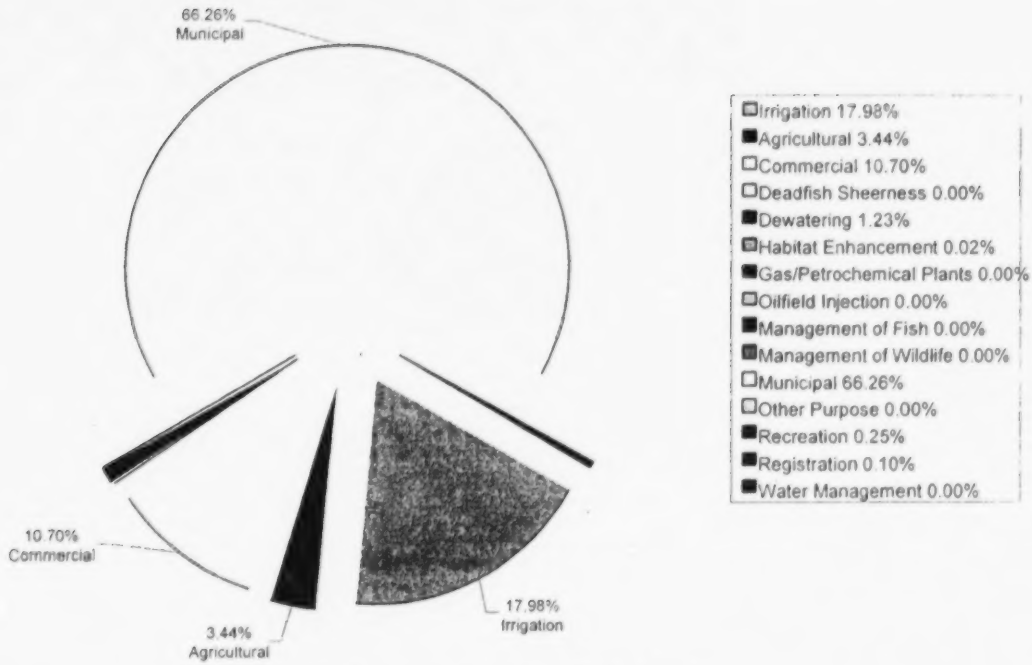
Bow River Basin
Licenced Water Use by Purpose

SOUTH SASKATCHEWAN RIVER BASIN
WATER ALLOCATION



Oldman River Basin
Licenced Water Use by Purpose

SOUTH SASKATCHEWAN RIVER BASIN
WATER ALLOCATION

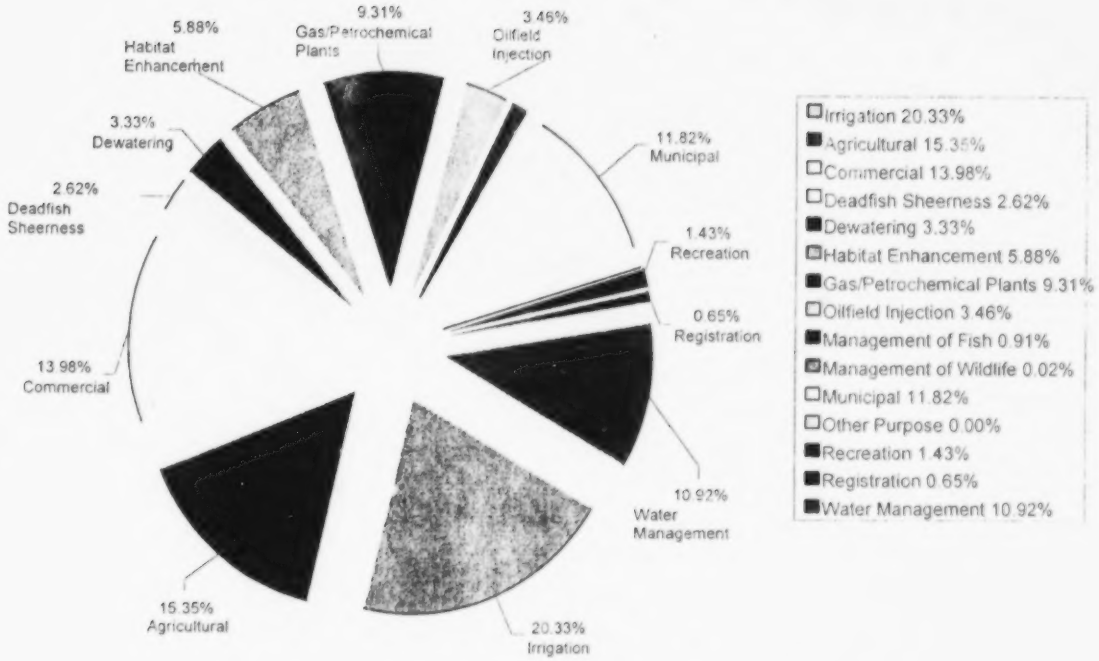


South Saskatchewan River Sub-basin

(Oldman/Bow Confluence to Border)

Licenced Water Use by Purpose

SOUTH SASKATCHEWAN RIVER BASIN
WATER ALLOCATION

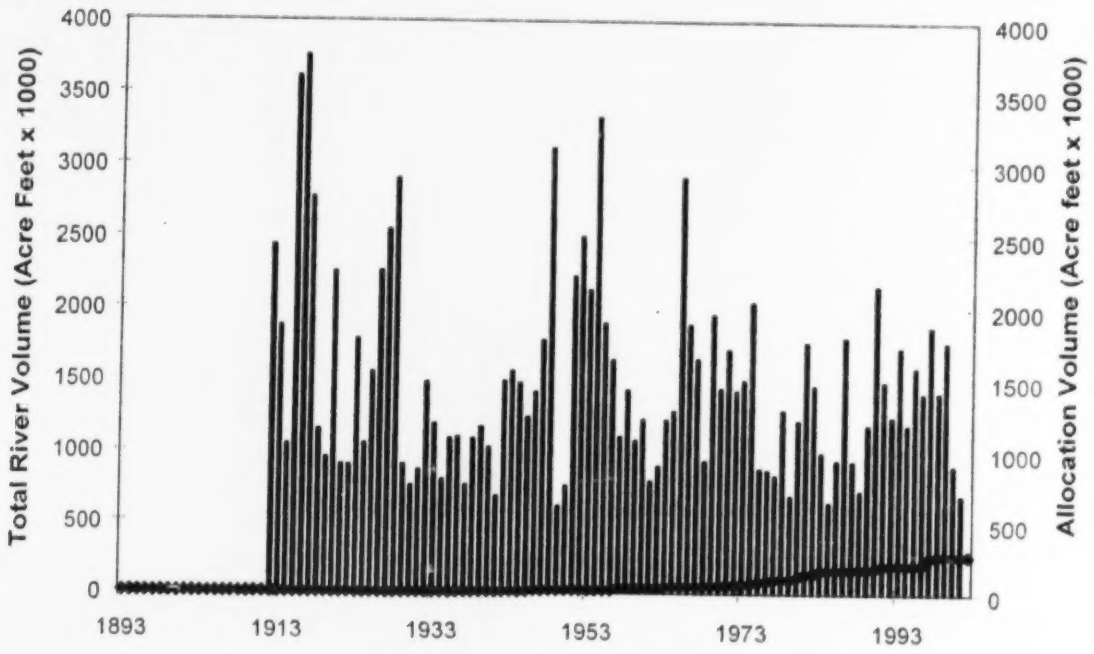


Red Deer River Basin
Licenced Water Use by Purpose

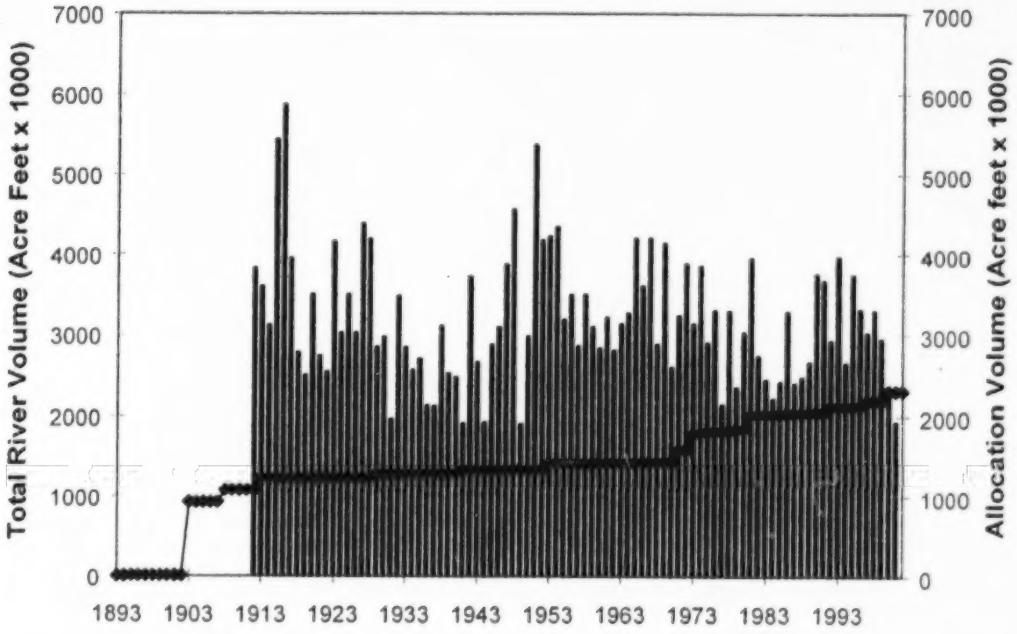
Appendix V

Historical Allocation Volume and Natural Flow Volume

Allocation Volume - Red Deer River Basin



Allocation Volume - Bow River Basin



Allocation Volume - Oldman River Basin